Nonsurgical Treatment of a Class III Patient with Alt-RAMEC Protocol and Facemask Therapy

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CASE REPORT

ABSTRACT

Class III malocclusion has been the subject of interest in many investigations because of the challenges in its treatment. The skeletal manifestation can be due to mandibular anterior positioning (prognathism) or growth excess (macrognathia), maxillary posterior positioning (retrognathism) or growth deficiency (micrognathia), or a combination of mandibular and maxillary discrepancies. A 15-year-old Asian with a skeletal Class III malocclusion and a severe anterior crossbite was treated with Alt-RAMEC protocol designed to loosen the sutures that connect the maxilla to the surrounding bones via rapid expansion and contraction on an alternating weekly basis and facemask therapy. An Angle Class I molar relationship was achieved with canine protected occlusion and incisal guidance. A wrap-around retainer was placed on the maxillary arch and a lingual bonded retainer on the mandibular arch. Treatment time was 30 months.

Keywords: Dentofacial orthopedics, Growth modification, Malocclusion cephalometrics, Class III, Circum maxillary-sutures, Alt-RAMEC, Retrognathism.


INTRODUCTION

Class III malocclusion has been the subject of interest in many investigations, because of the challenges in its treatment. Angle classified the malocclusions based on occlusal relationships, considering the first permanent molar as the ‘key’ to occlusion.1 Class III malocclusion is defined in cases that mandibular first molar is positioned mesially relative to the first molar of maxilla. The prevalence of Class III malocclusion has been described between 1 and 10%,2-4 depending on ethnic background,2,5 sex,4,6 and age7 of the sample as well as the diagnostic criteria used.8 A complicating factor for diagnosis and treatment of Class III malocclusion is its etiologic diversity. Its origin can be skeletal or dentoalveolar. The skeletal manifestation can be due to mandibular anterior positioning (prognathism) or growth excess (macrognathia), maxillary posterior positioning (retrognathism) or growth deficiency (micrognathia), or a combination of mandibular and maxillary discrepancies.

A wide range of environmental factors have been suggested as contributing to the development of Class III malocclusion. Among those are enlarged tonsils,9 difficulty in nasal breathing,9 congenital anatomic defects,10 disease of the pituitary gland,11 hormonal disturbances,12 a habit of protruding the mandible,13 posture,11 trauma and disease,10 premature loss of the sixth-year molar11 and irregular eruption of permanent incisors or loss of deciduous incisors.12 Other contributing factors, such as the size and relative positions of the cranial base, maxilla and mandible, the position of the temporomandibular articulation and any displacement of the lower jaw also affect both the sagittal and vertical relationships of the jaw and teeth.11-16 The position of the foramen magnum and spinal column17 and habitual head position18 may also influence the eventual facial pattern. The etiology of Class III malocclusion is thus wide ranging and complex.

Class III malocclusions are difficult for treatment planning. The clinician must choose either a camouflage treatment to mask the Class III malocclusion or a surgical alternative to correct the skeletal imbalance. In young patients, the circummaxillary sutures are patent, and opening of these sutures with orthopedic force can facilitate forward movement of the maxilla.

DIAGNOSIS AND ETIOLOGY

The patient was an Asian boy, aged 15 years, with an unremarkable medical history. He had a Class III dental malocclusion and a slightly concave facial profile. His maxilla appeared to be recessive. The maxillary and mandibular dentition showed near normal alignment. His chief concerns...
were ‘my lower teeth are bulging out and I have a very prominent chin.’ The facial (Fig. 1) and intraoral photographs (Fig. 2) demonstrate a slightly concave facial profile. The patient was able to close his lips without mentalis strain. The mandibular midline was deviated 2 mm toward his right. The dental casts (Fig. 3) show an Angle Class III occlusion on both left and right side. There was a crossbite of the maxillary teeth on the right and a negative overjet of –3 mm. The maxillary and mandibular second molars were erupted. The mandibular midline deviated by 2 mm. The pretreatment cephalogram and its tracing (Fig. 4) showed an ANB angle of –3.5°. The Wits appraisal of –11.5 mm confirmed a skeletal Class III alveolar imbalance. The FMA of 28° suggested a vertical skeletal discrepancy. The Jaraback ratio (anterior facial height/posterior facial height) of 66.39% suggested a horizontal growth tendency. The panoramic radiograph (Fig. 4) showed no pathology, supernumeraries or congenitally absent teeth. The maxillary second permanent molars were erupted. After the casts, the radiographs, the photos, and the patient were studied, it was decided to approach his problem as a Class III malocclusion with retrognathic maxilla and prognathic mandible.

**TREATMENT OBJECTIVES**

The treatment objectives were to: (1) obtain a normal profile line to nose relationship, (2) obtain normal canine and incisal guidance, (3) correct the anterior crossbite, (4) correct the Class III dental relationship and (5) place the dental midlines in the middle of the patient’s face.

**TREATMENT ALTERNATIVES**

1. Using an extraction protocol, doing a camouflage treatment.
2. Using the conventional RME and facemask therapy for protraction of the maxilla.

**TREATMENT PLAN**

Merrifield’s total space analysis\textsuperscript{19,20} was used to determine space requirements. A decision was made not to extract any tooth and treat the case with a nonextraction protocol. As no expansion of the maxillary arch was required, the Alt-RAMEC
protocol using Hyrax screw was chosen to disarticulate the maxilla followed by protraction with facemask therapy. This was followed by treatment with fixed orthodontic appliance MBT 0.022 slot for final occlusal settling.

**TREATMENT PROGRESS**

The Alt-RAMEC protocol was designed to loosen the sutures that connect the maxilla to the surrounding bones via rapid expansion and contraction on an alternating weekly basis. For this case, a 7-week protocol was used. The maxilla was expanded or contracted 1 mm per day (two turns in the morning and two turns in the evening). The mobility of the maxilla was checked before proceeding to maxillary protraction. The maxilla could be clinically examined for mobility by holding patients’ head with one hand and rocking the anterior segment of the maxilla up and down with the other hand.

The Petit protraction facemask was used for maxillary protraction. To avoid an opening of the bite as the maxilla was protracted, the elastics were attached near the maxillary canines with a downward and forward pull of 30° to the occlusal plane. A Correx gauge was used to measure the elastic force on the Alt-RAMEC to ensure that approximately 380 gm of force was generated on each side. Patient was instructed to wear the protraction facemask for 10 to 12 hours per day, which included night-time wear.

All teeth were simultaneously banded or bonded with a 0.022” standard MBT appliance.

After the Alt-RAMEC protocol for 7 weeks, the hyrax appliance was left in place for another 4 months for stabilization. The molars and canines were now in Class I and the anterior crossbite was corrected. Following this vertical, triangular, and Class III elastics were used as needed for final occlusal settling.

**TREATMENT RESULTS**

The post-treatment facial (Fig. 5) and intraoral photographs (Fig. 6) illustrate the improvement in the patient’s profile. His midlines are coincident and in the center of his face. The post-treatment cephalometric radiograph and its tracing (Fig. 7) illustrate the changes achieved with treatment. The mandibular incisors were uprighted over the basal bone to an IMPA angle of 88°. The FMA angle increased to 30°. The Wits appraisal improved to 1 mm. The changes can be seen on pre- and post-treatment superimpositions (Fig. 8). The post-treatment panoramic radiograph (Fig. 7) exhibits no pathology.

**DISCUSSION**

Patients having Class III malocclusion may present with an anterior crossbite and/or a Class III molar relationship. Individuals with a true skeletal Class III malocclusion present with either a midface deficiency and/or mandibular prognathism. It has been reported that a significant percentage of the skeletal Class III malocclusion cases are due to maxillary retrusion. In young patients, the circumaxillary sutures are patent,
and opening of these sutures with orthopedic force can facilitate forward movement of the maxilla. Rapid maxillary expansion has been postulated as a means of disarticulating the maxilla from the surrounding bones connected by circumaxillary sutures. However, the circumaxillary sutures start to interlock or interdigitate during pubertal growth, making them difficult to protract in older patients.²³ It was suggested that alternate rapid maxillary expansions and contractions (Alt-RAMEC) can increase the amount of maxillary protraction and result in a shorter period of protraction.²⁴-²⁶ An animal study suggested that 5 weeks of Alt-RAMEC opened both the sagittal and coronal circumaxillary sutures more extensively than 1 week of RME.²⁷

The Alt-RAMEC protocol has been shown to produce significant anterior movement of point A in cleft-palate patients when used in combination with intraoral protraction springs.²¹,²⁸ Isci et al reported a significantly greater increase in SNA (+1.2°) and improvement in ANB (+1.6°) and overjet (+2.2 mm) in a group treated with Alt-RAMEC (0.4 mm of activation/deactivation per day over 4 weeks) and facial masks (±2.2 mm) in a group treated with RME/FM (0.4 mm of activation/deactivation per day over 4 weeks) and facial masks (±2.2 mm). However, the circumaxillary sutures start to interlock or interdigitate or the surrounding bones connected by circumaxillary sutures.³⁰

CONCLUSION
This treatment improved the patient's profile, corrected the crossbite and gave him an excellent functional occlusion. This treatment result could not have been accomplished without excellent patient cooperation. Maxillary protraction in Class III patients using the hyrax expander for a repetitive protocol or Alt-RAMEC, and protraction facemask appears to be an effective treatment course, and the results obtained remain stable.

REFERENCES